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Kuprin et al.

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(54) **RETROFIT OPTICAL FIBER CONNECTOR MODULE**

(71) Applicant: **Molex, LLC**, Lisle, IL (US)

(72) Inventors: **Igor Kuprin**, Buffalo Grove, IL (US); **Wenzong Chen**, Naperville, IL (US); **Thomas D. Schiltz**, Naperville, IL (US)

(73) Assignee: **Molex, LLC**, Lisle, IL (US)

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Related U.S. Application Data

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G02B 6/38 (2006.01)

(52) **U.S. Cl.**
CPC ***G02B 6/3885*** (2013.01); ***G02B 6/3821*** (2013.01); ***G02B 6/3826*** (2013.01); ***G02B 6/3887*** (2013.01)

(58) **Field of Classification Search**
CPC .. G02B 6/3826; G02B 6/3869; G02B 6/3885; G02B 6/4403
See application file for complete search history.

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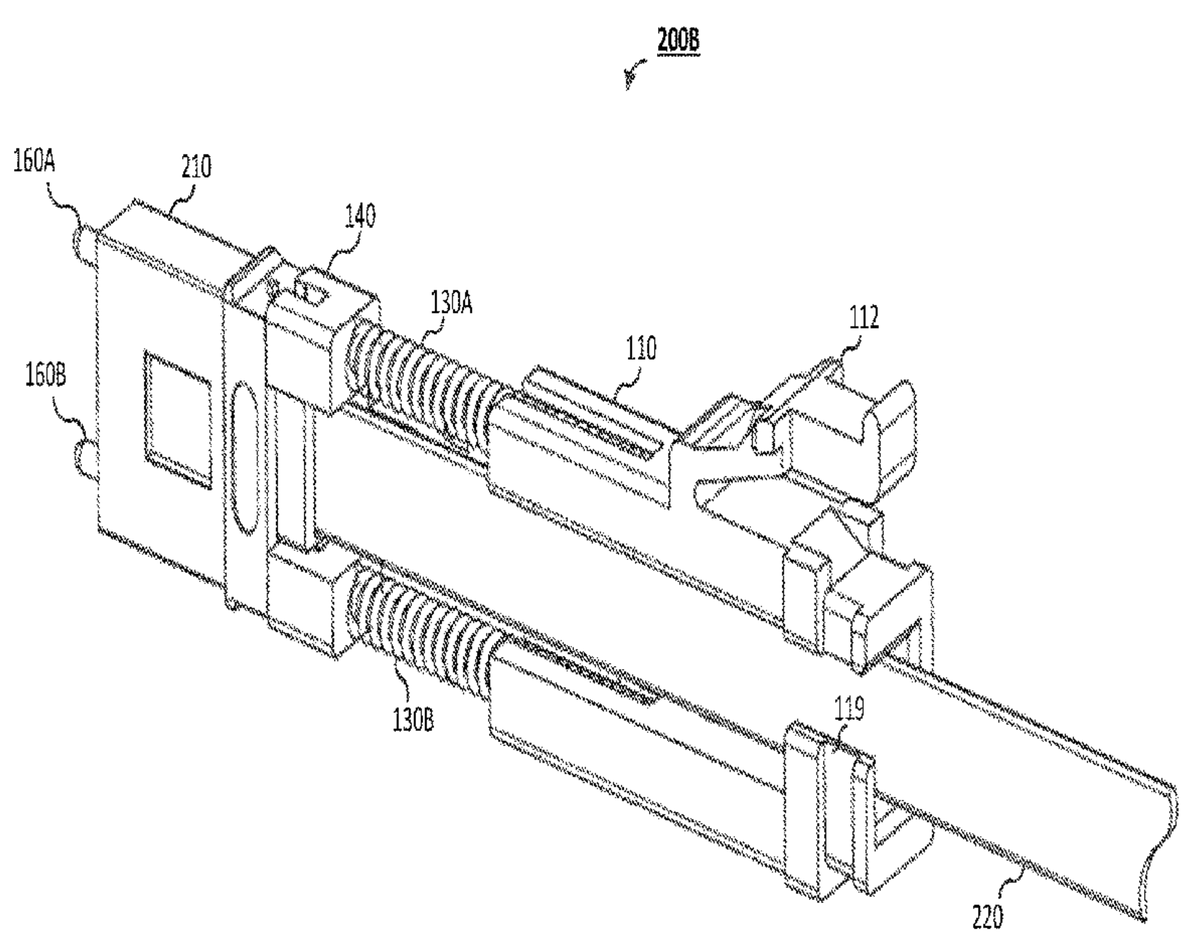
Primary Examiner — Michael Stahl

(57) **ABSTRACT**

An optical fiber connector module for coupling to a ferrule terminated to at least one fiber in a ribbon cable is provided. The optical fiber connector module may include a first connector body member for coupling to the ferrule, the first connector body member including at least one alignment component coupling section, at least one biasing component coupling section, and a first through-channel for the ribbon cable. The optical fiber connector module may include a second connector body member coupled to the first connector body member, the second connector body member including at least one biasing component coupling section, a second through-channel for the ribbon cable, and an open side spanning the length of the second connector body member providing access to the second through-channel for the ribbon cable.

19 Claims, 12 Drawing Sheets



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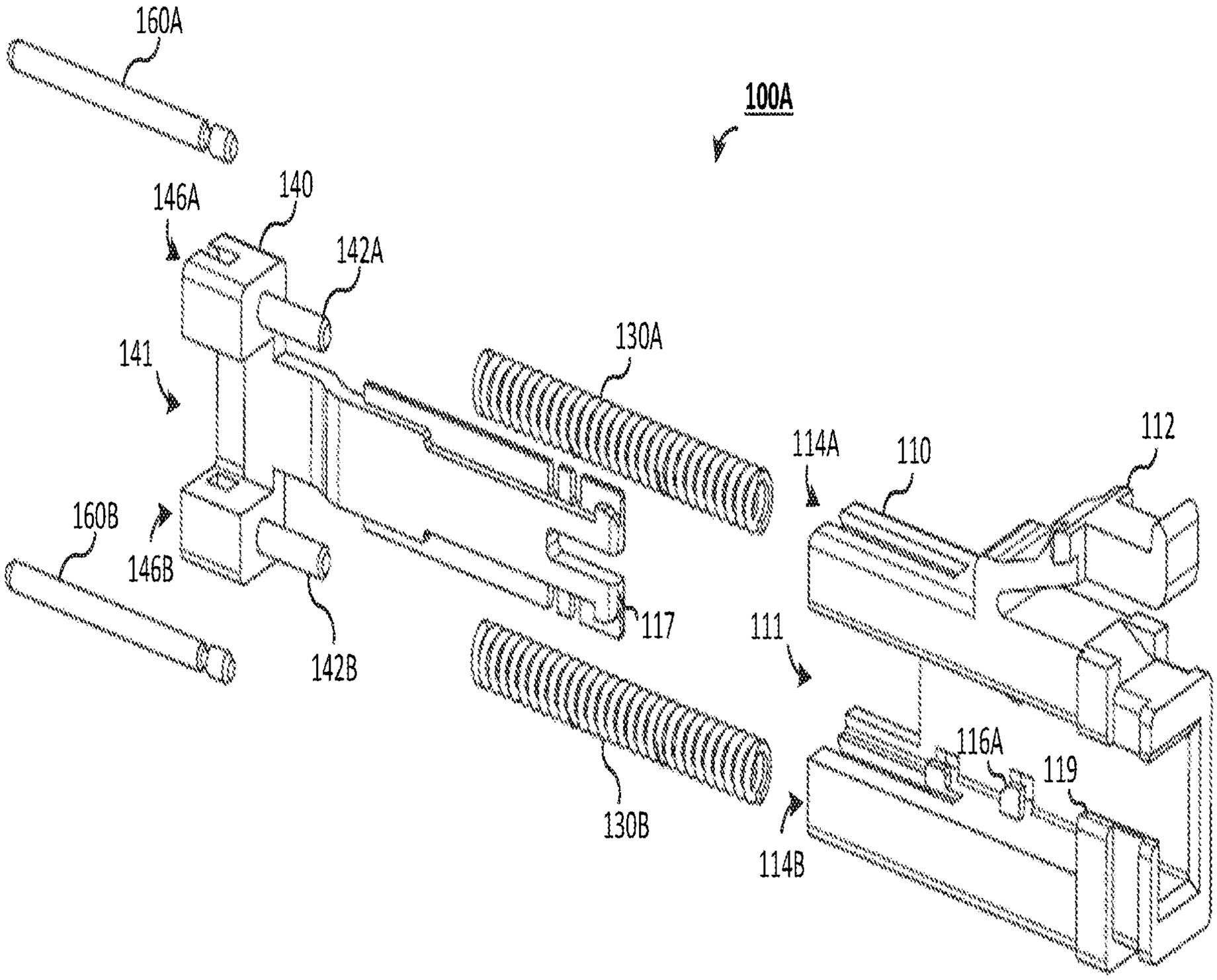
160A
100A
146A
140
142A
141
130A
114A
110
112
160B
146B
117
111
142B
116A
119
130B
114B

FIG. 1A

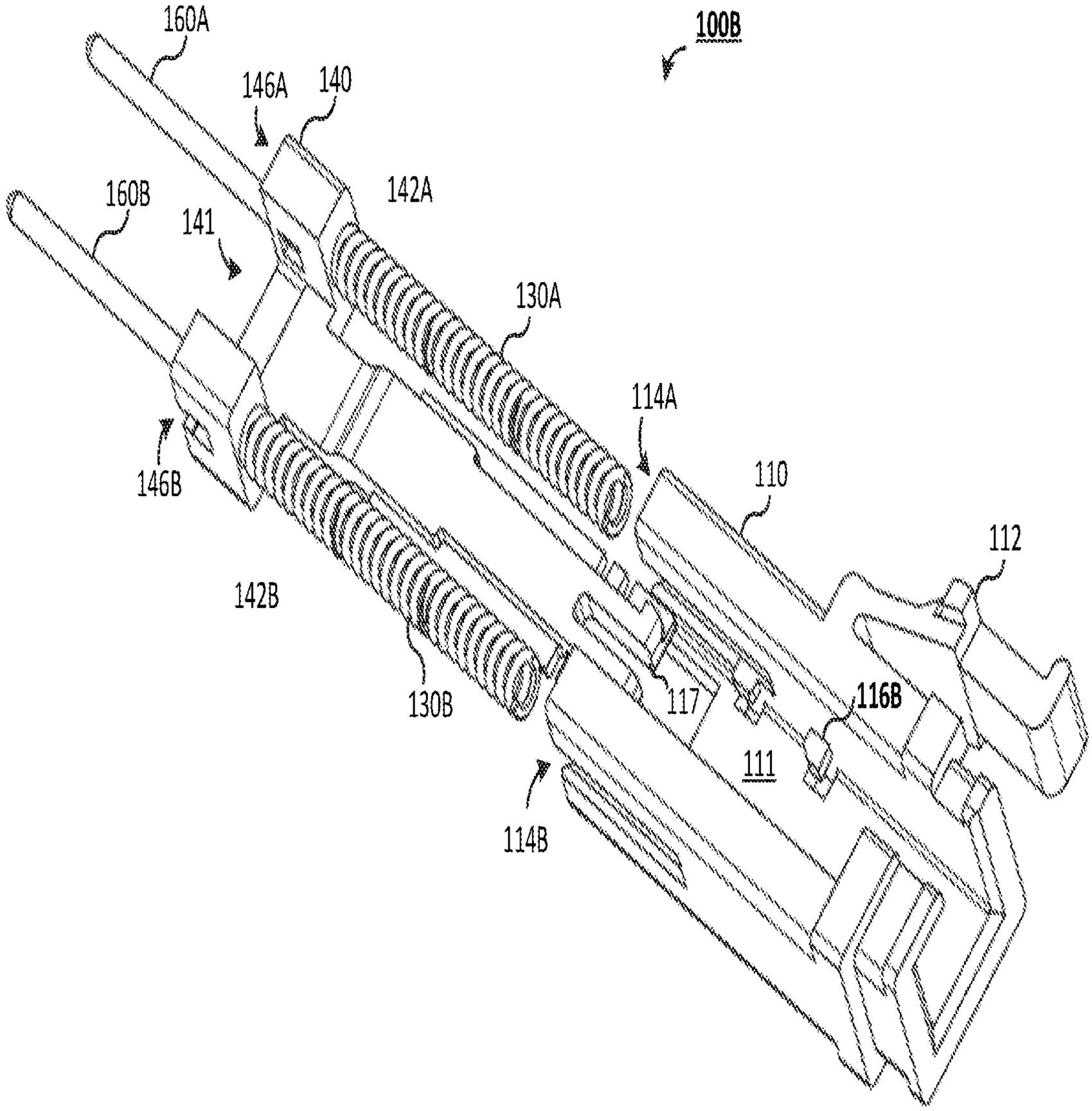
160A
146A
140
100B
160B
141
142A
130A
114A
146B
110
112
142B
130B
117
116B
111
114B

FIG. 1B

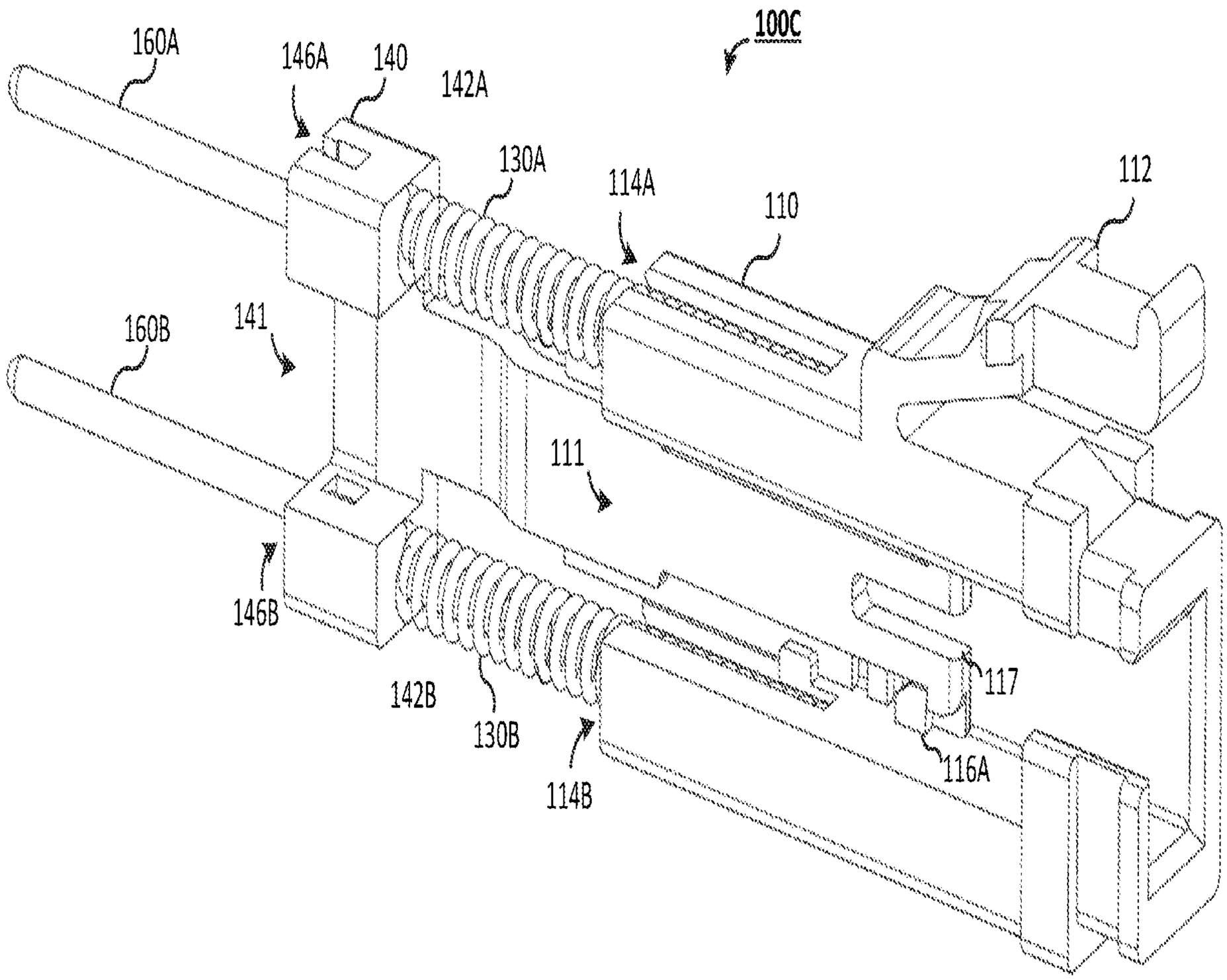
100C
160A
146A
140
142A
130A
114A
110
112
141
160B
111
146B
142B
130B
114B
117
116A

FIG. 1C

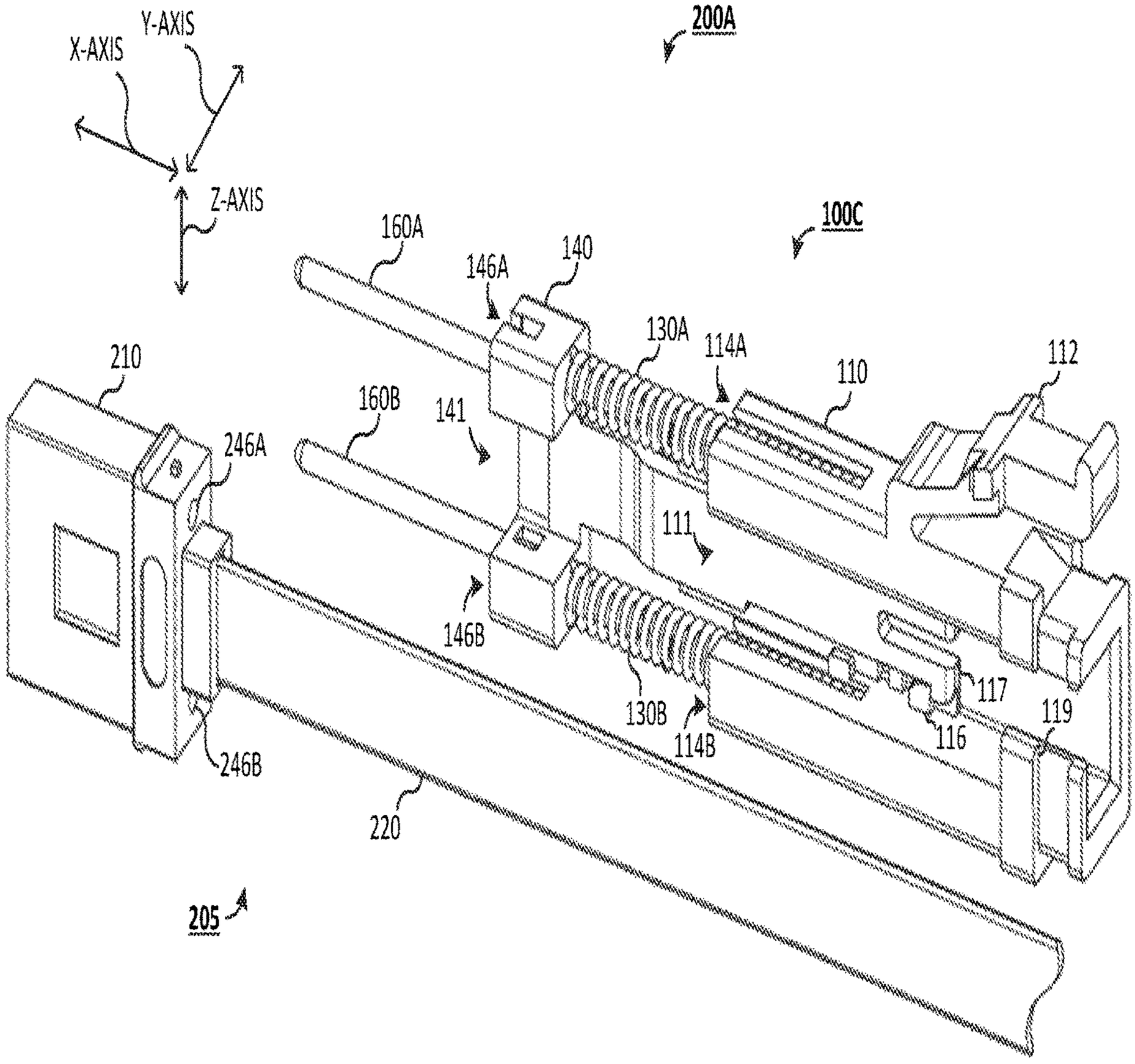
Y-AXIS
X-AXIS
Z-AXIS
200A
100C
160A
146A
140
130A
114A
112
210
110
160B
141
246A
111
146B
130B
114B
117
119
116
246B
220
205

FIG. 2A

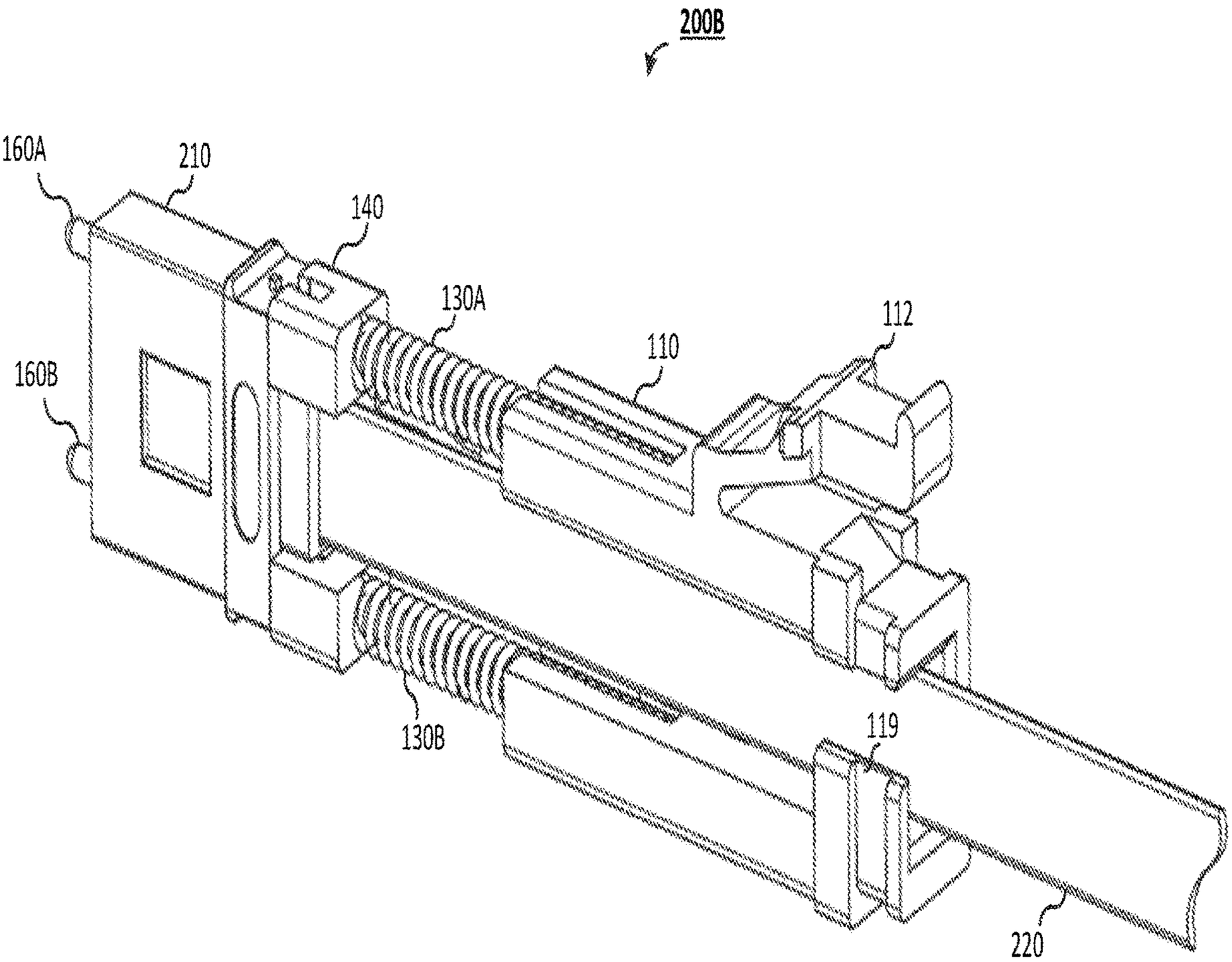

FIG. 2B

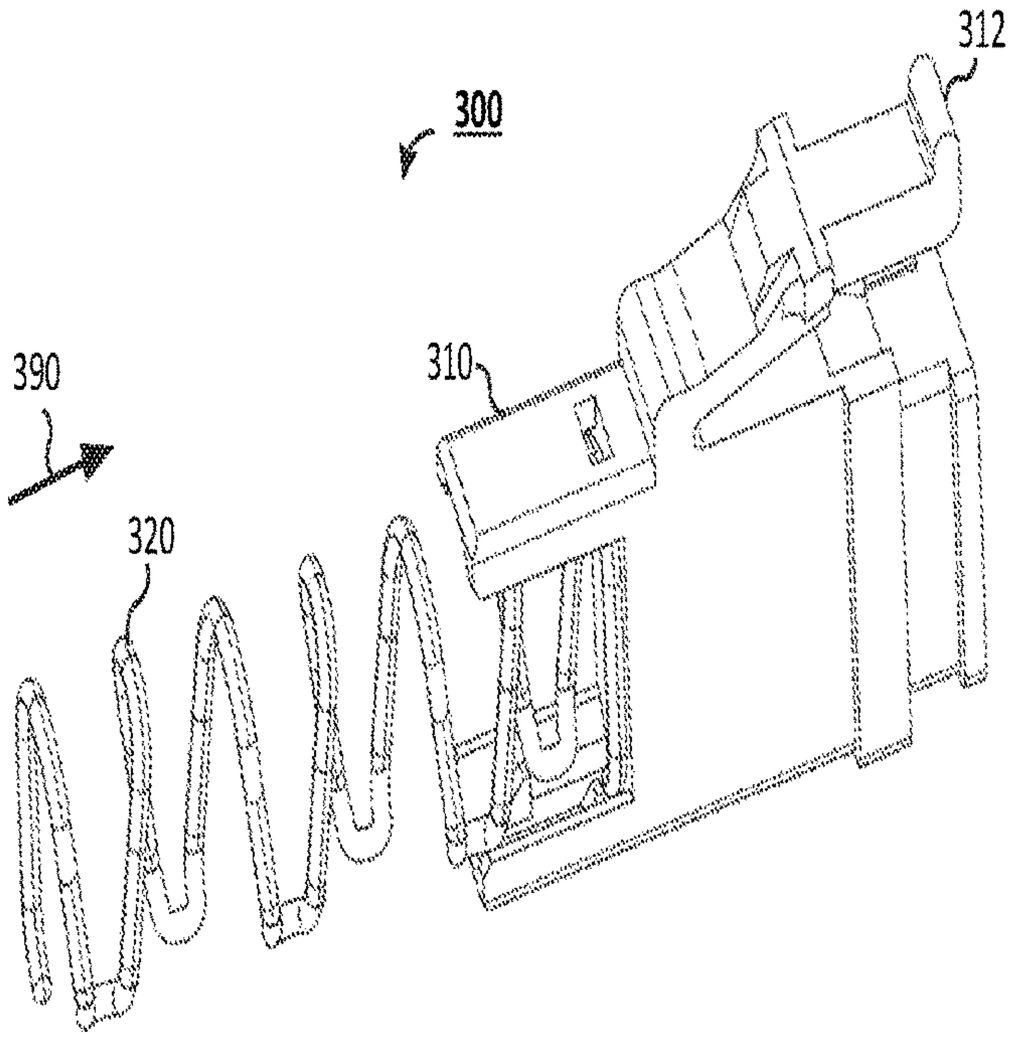

FIG. 3A

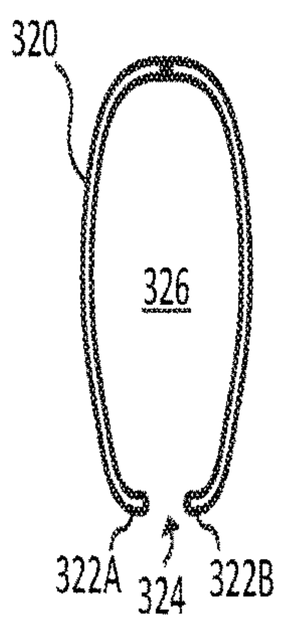

FIG. 3C

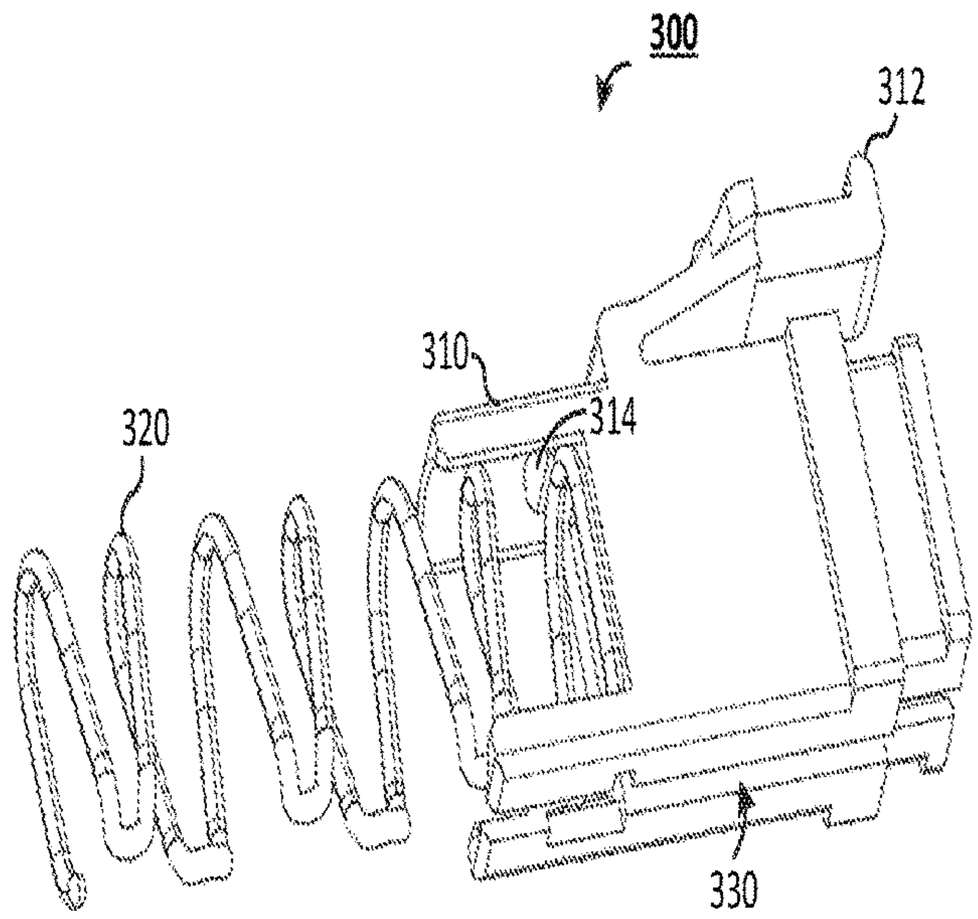

FIG. 3B

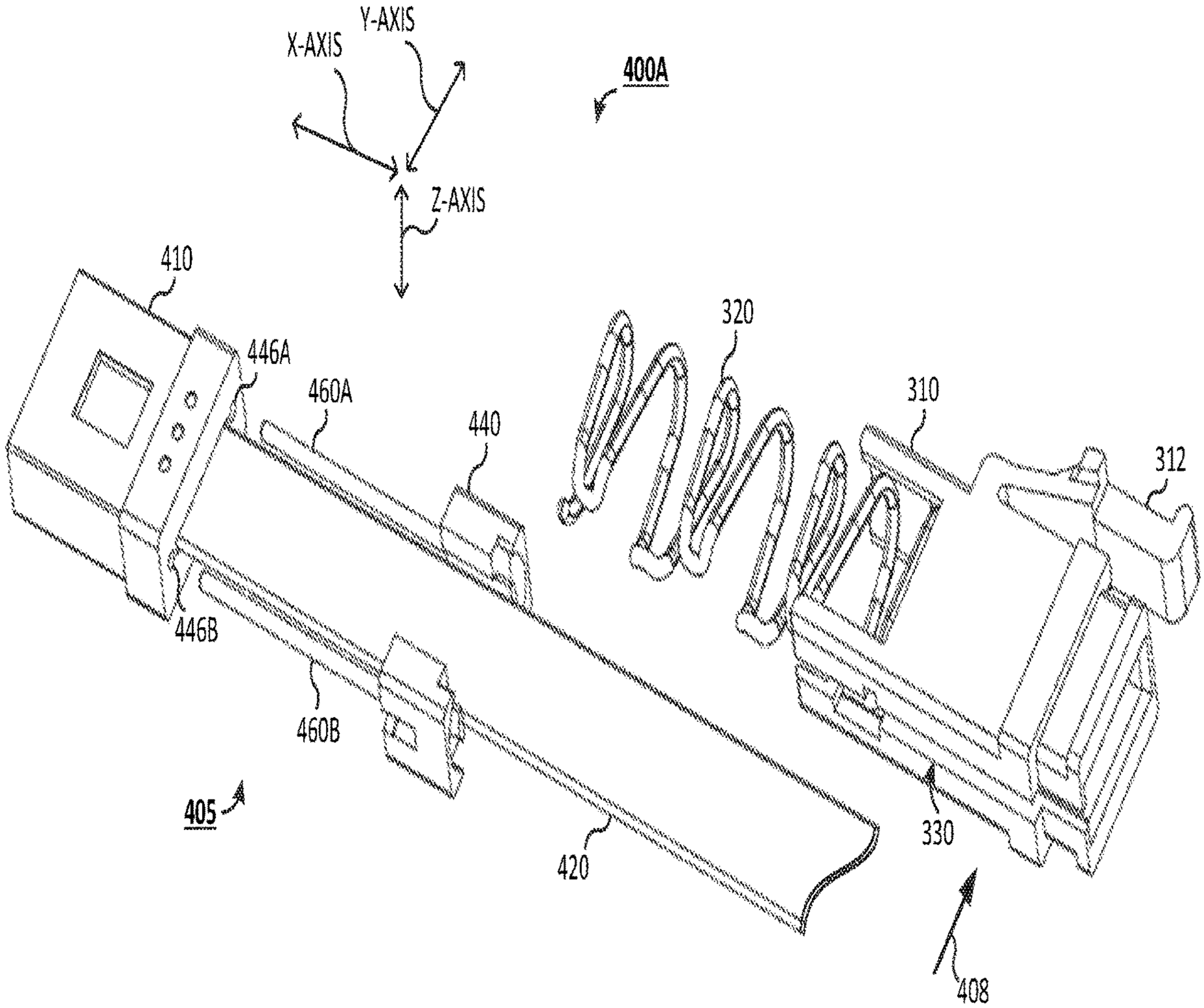
Y-AXIS
X-AXIS
400A
Z-AXIS
410
446A
460A
440
320
310
312
446B
460B
405
420
330
408

FIG. 4A

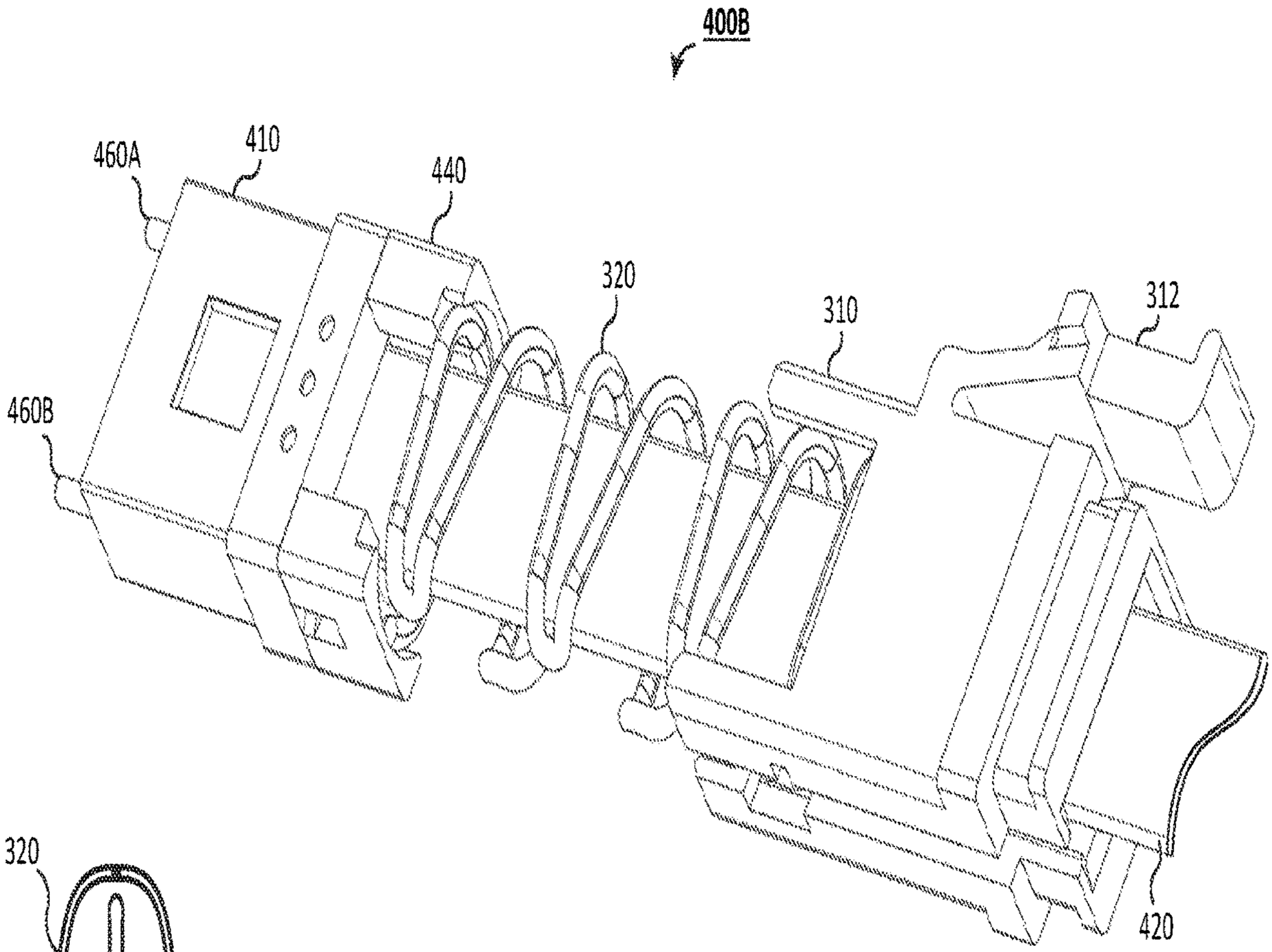

FIG. 4B

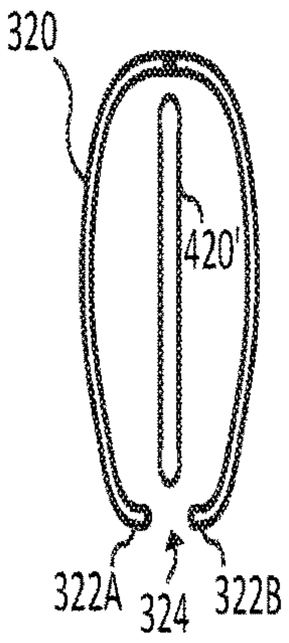

FIG. 4C

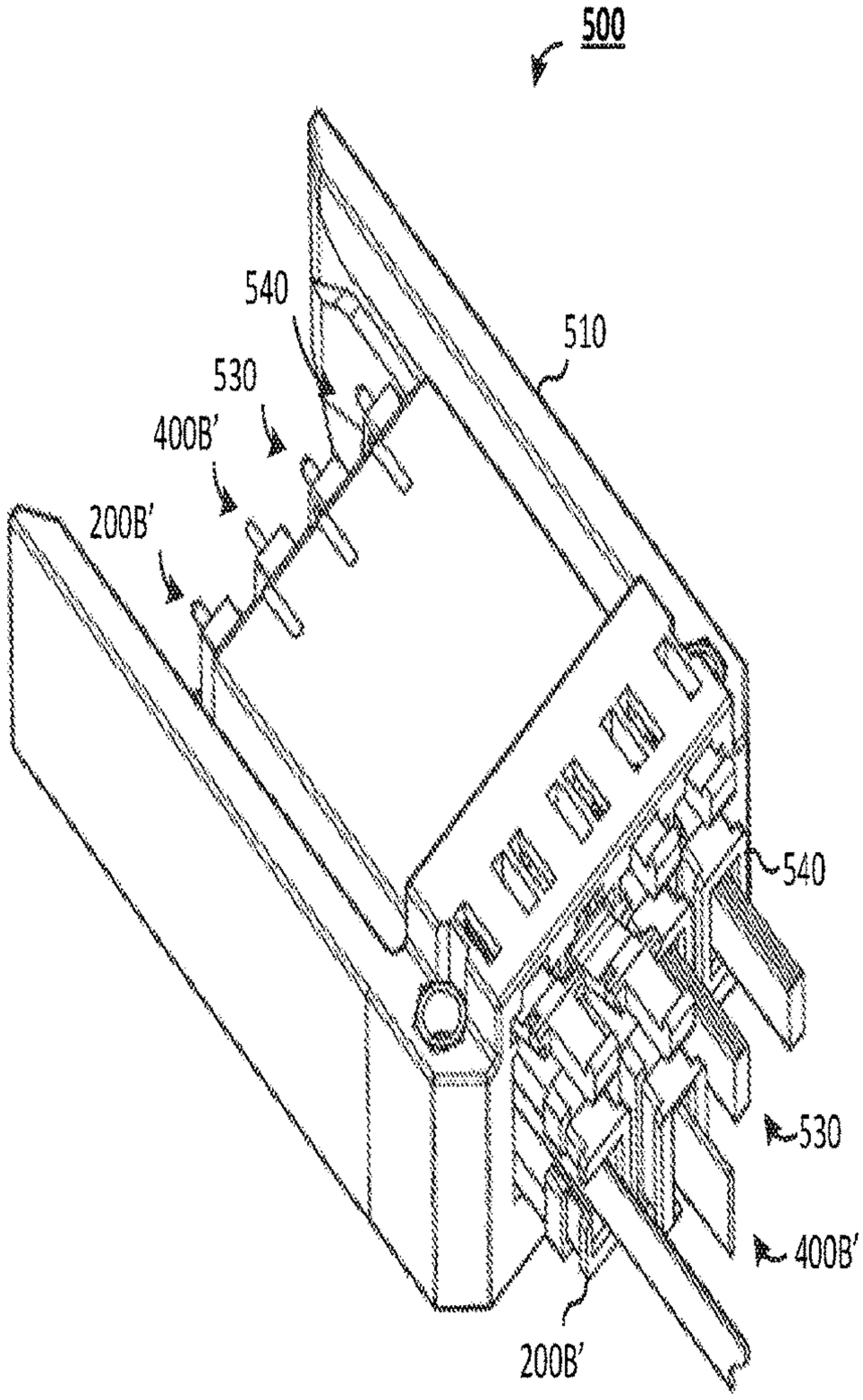
500
540
510
530
400B'
200B'
540
530
400B'
200B'

FIG. 5A

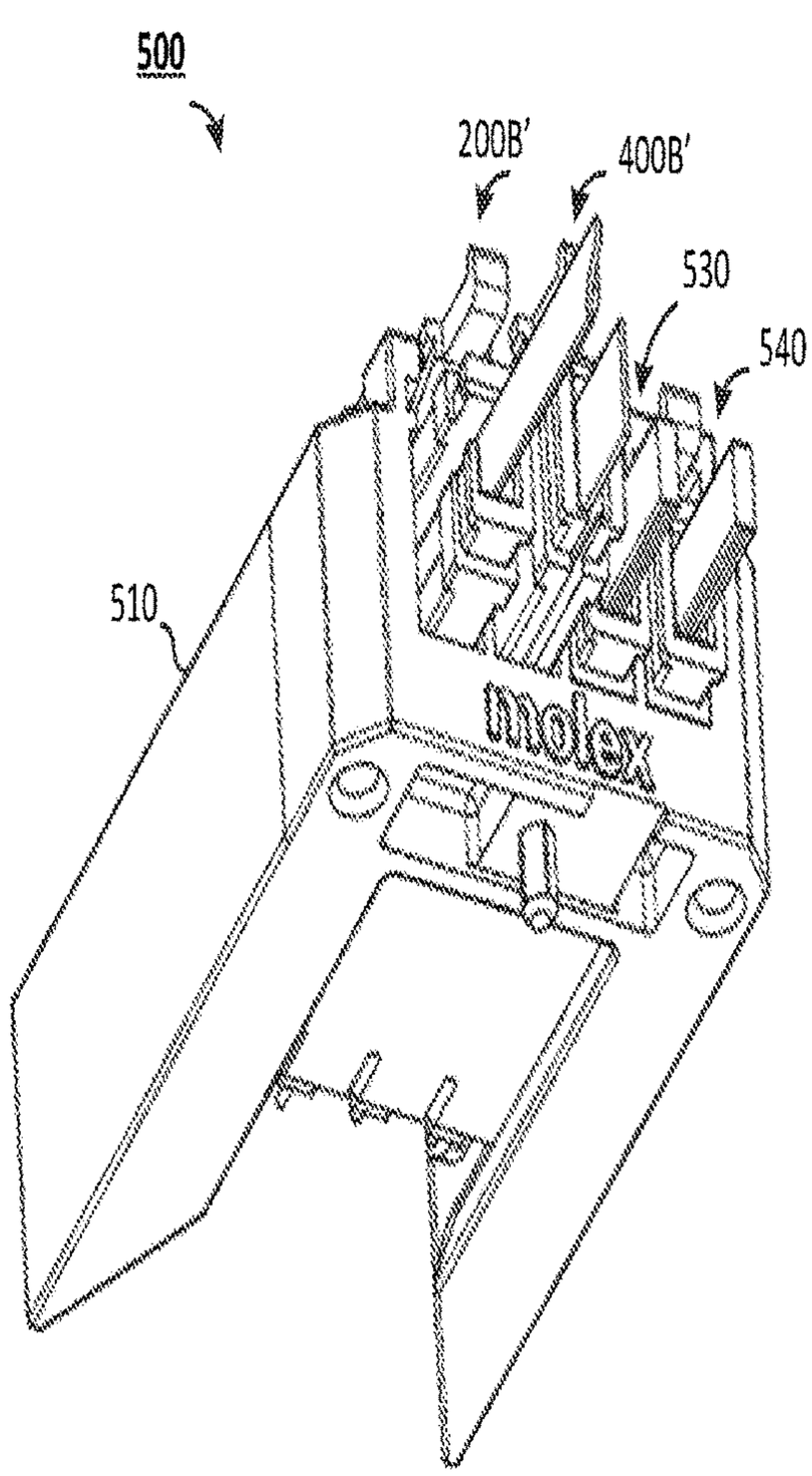
500
200B'
400B'
530
540
510
molex

FIG. 5B

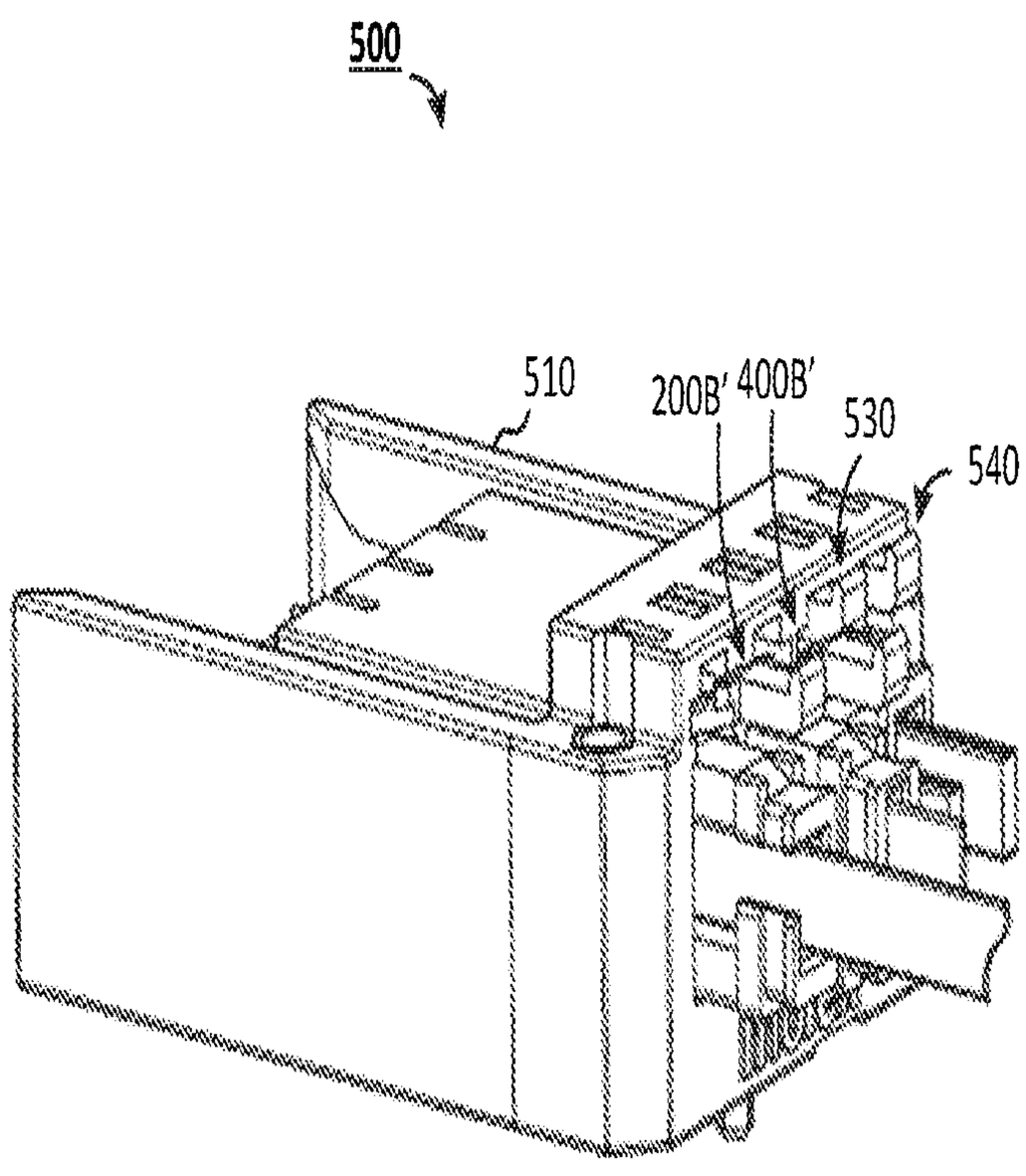

FIG. 5C

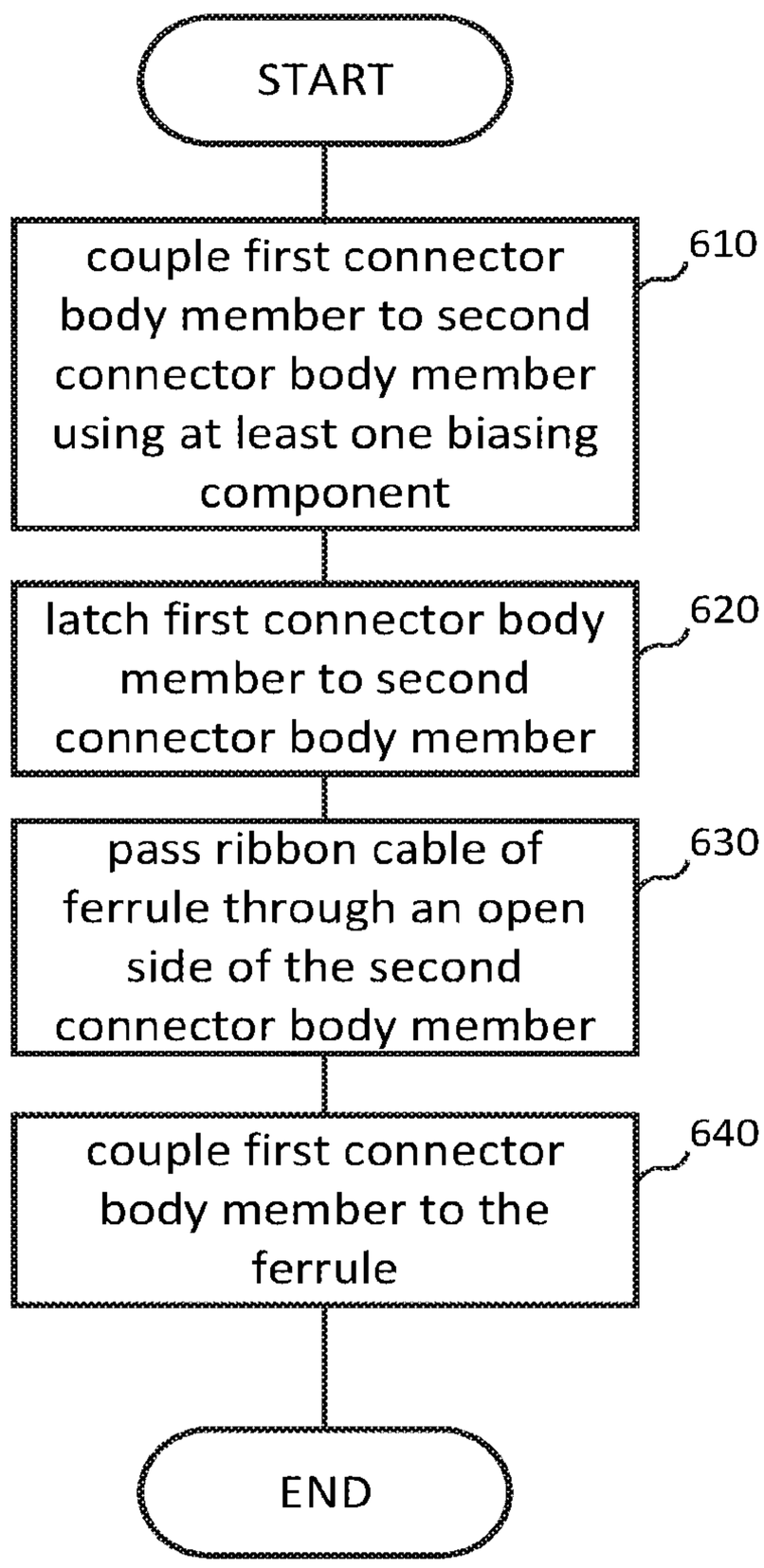
600
START
couple first connector body member to second connector body member using at least one biasing component
610
latch first connector body member to second connector body member
620
pass ribbon cable of ferrule through an open side of the second connector body member
630
couple first connector body member to the ferrule
640
END

FIG. 6

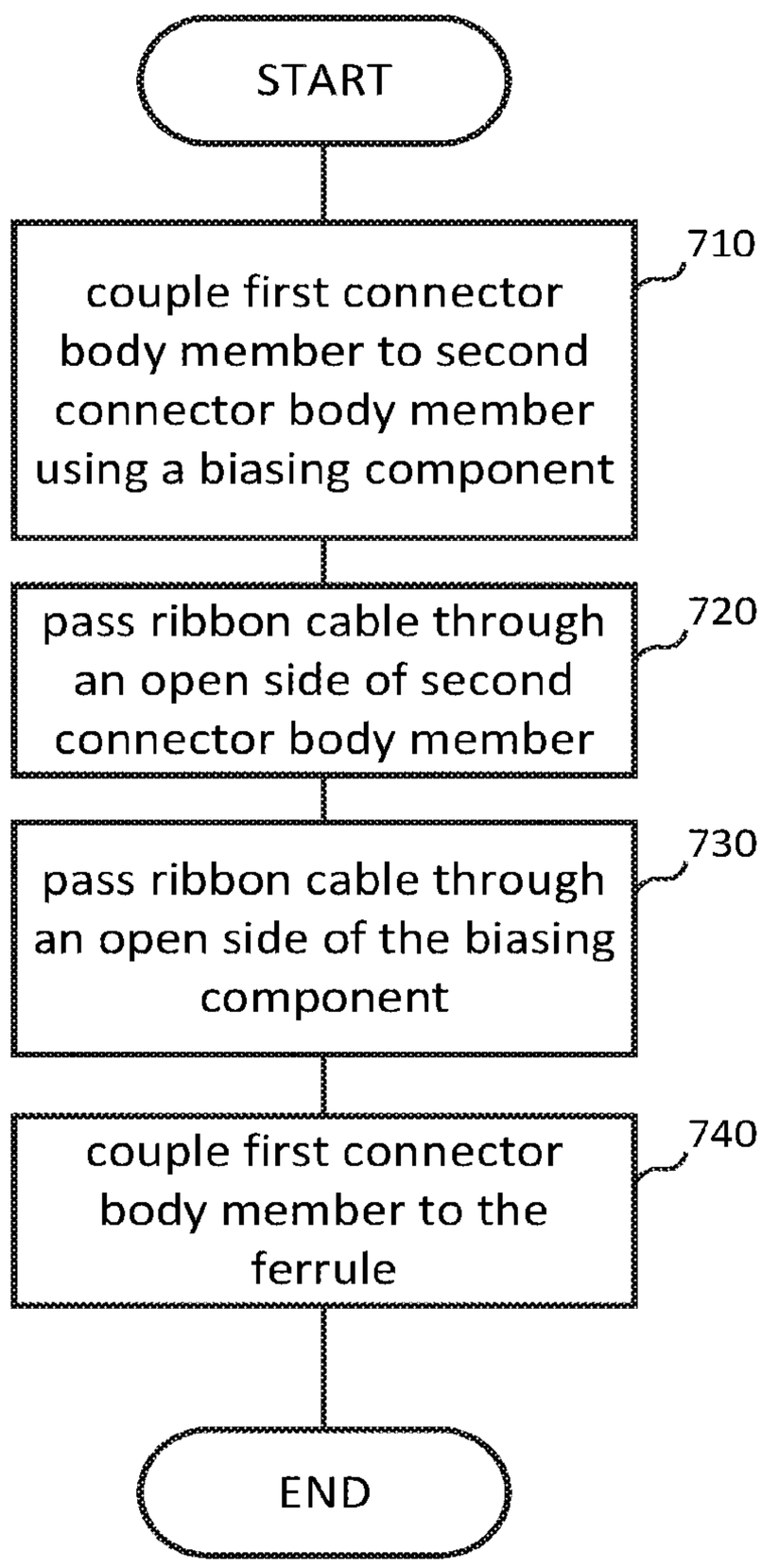
700
START
couple first connector body member to second connector body member using a biasing component
710
pass ribbon cable through an open side of second connector body member
720
pass ribbon cable through an open side of the biasing component
730
couple first connector body member to the ferrule
740
END

FIG. 7

RETROFIT OPTICAL FIBER CONNECTOR MODULE

RELATED APPLICATIONS

This application is a continuation of U.S. Ser. No. 16/798,425, filed Feb. 23, 2020, which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

The present disclosure relates to the field of optical fiber connector assemblies, and more particularly, but not exclusively, to connector assemblies including terminated ferrules.

BACKGROUND

Systems for interconnecting optical fibers or optical waveguides typically utilize a mating optical fiber interconnect assembly to facilitate the handling and accurate positioning of optical fibers. Individual optical fibers may be secured within a ferrule of the interconnect assembly with pairs of the optical fiber interconnect assemblies mated in an adapter to center the fibers for providing low insertion losses. The adapter couples the connectors together so that their encapsulated fibers connect end-to-end.

Various problems continue to be encountered in designing optical fiber connector assemblies or other connector assemblies. Such problems include the process for manufacturing and putting the optical fiber connector assemblies together. For example, due to the number of components involved, the process may be difficult and expensive, with any mistakes and damage to components during assembly magnifying the expense.

The present disclosure is directed to solving these problems and to provide various improvements in the connector assemblies and the process for putting them together.

SUMMARY

In an aspect of the disclosure, an optical fiber connector module for coupling to a ferrule terminated to at least one fiber in a ribbon cable is provided. The optical fiber connector module may include a first connector body member for coupling to the ferrule, the first connector body member including at least one alignment component coupling section, at least one biasing component coupling section, and a first through-channel for the ribbon cable. The optical fiber connector module may include a second connector body member coupled to the first connector body member, the second connector body member including at least one biasing component coupling section, a second through-channel for the ribbon cable, and an open side spanning the length of the second connector body member providing access to the second through-channel for the ribbon cable.

In another aspect of the disclosure, an optical fiber connector module for coupling to a ferrule terminated to at least one fiber in a ribbon cable is provided. The optical fiber connector module may include a biasing component having a structure with an open side for side insertion of the ribbon cable. The optical fiber connector module may include a first connector body member for coupling to the ferrule, the first connector body member including at least one alignment component coupling section, a biasing component coupling section, and a first through-channel for the ribbon cable. The optical fiber connector module may include a second connector body member coupled to the first connector body member, the second connector body member including a biasing component coupling section, a second through-channel for the ribbon cable, and a second open side spanning the length of the second connector body member providing access to the second through-channel for the ribbon cable.

In another aspect of the disclosure, a method is provided for assembling an optical fiber connector module that couples to a ferrule terminated to at least one fiber in a ribbon cable, with the method being performed in any operative order. The method may include coupling, using at least one biasing component, a first connector body member to a second connector body member. The method may include latching the first connector body member to the second connector body member. The method may include passing the ribbon cable of the ferrule through an open side of the second connector body member. The method may include coupling, using at least one alignment component, the first connector body member to the ferrule.

In another aspect of the disclosure, a method is provided for assembling an optical fiber connector module that couples to a ferrule terminated to at least one fiber in a ribbon cable, with the method being performed in any operative order. The method may include coupling, using a biasing component, a first connector body member to a second connector body member. The method may include passing the ribbon cable of the ferrule through an open side of the second connector body member into a through-channel of the second connector body member. The method may include passing the ribbon cable of the ferrule through an open side of the biasing component into the interior of the biasing component. The method may include coupling, using at least one alignment component, the first connector body member to the ferrule.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1**A is an exploded perspective view of an exemplary connector module including multiple body members, springs, and alignment pins.

FIG. **1**B is a perspective view of a partially assembled exemplary connector module, e.g., using the components of connector module **100**A of FIG. **1**.

FIG. **1**C is a perspective view of an assembled exemplary connector module, e.g., using the components of connector module **100**A of FIG. **1**.

FIG. **2**A is a perspective view of the assembled exemplary connector module next to a terminated ferrule.

FIG. **2**B is a perspective view of the assembled exemplary connector module mated to the terminated ferrule.

FIGS. **3**A-B are perspective views of another exemplary connector module including a body member and spring.

FIG. **3**C is diagram illustrating a front view of the spring of FIG. **3**A.

FIG. **4**A is a perspective view of the assembled exemplary connector module of FIG. **3**A next to a terminated ferrule within another body member of the exemplary connector module.

FIG. **4**B is a perspective view of the assembled exemplary connector module of FIG. **3**A mated to the terminated ferrule.

FIG. **4**C is a diagram illustrating a perspective of the spring of FIG. **3**A when viewed from the front with a cross-section view of the ribbon cable deposited within the spring.

FIGS. **5**A-C are perspective views of the mated connectors latched into a housing, with FIG. **5**A showing a top perspective view, FIG. **5**B showing a bottom perspective view, and FIG. **5**C showing a side perspective view.

FIG. **6** is a flow chart illustrating an exemplary method for assembling a connector module.

FIG. **7** is a flow chart illustrating another exemplary method for assembling a connector module.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The detailed description set forth below in connection with the appended drawings is intended as a description of various configurations and is not intended to represent the only configurations in which the concepts described herein may be practiced. The detailed description includes specific details for the purpose of providing a thorough understanding of various concepts. It will, however, be apparent to those skilled in the art that these concepts may be practiced without these specific details. In some instances, well known structures and components are shown in block diagram form in order to avoid obscuring such concepts.

Several aspects of the connector modules will now be presented with reference to various apparatuses and methods. These apparatuses and methods will be described in the following detailed description and illustrated in the accompanying drawings by various blocks, modules, components, steps, processes, etc. (collectively referred to as "elements"). While the methods may be described in an ordered series of steps, it will be apparent to those skilled in the art that the methods may be practiced in any operative order and each step may be practiced in various forms that are apparent to those skilled in the art.

Disclosed herein are optical fiber connector modules and methods for assembling the optical fiber connector modules. Optical fiber connector modules are used within optical communication systems and provide an important connection point by aligning and coupling segments of optical fiber cables (e.g., with the connector modules latched at different ends of a housing) so that signals may be transmitted between the segments. In the various embodiments, the connector modules may be mechanical transfer (MT) connectors. The connector modules may include MT ferrules.

In the disclosure, various terms may be used to describe the connector assembly such as plug assembly, connector module, etc. Connector module, optical fiber connector module, or simply module or assembly may be used interchangeably in the disclosure. These terms may refer to the entire structure that includes an optical fiber core, a ferrule, and other body components. In some instances, the terms may refer to subcomponents or sub-assemblies.

FIG. **1**A is an exploded perspective view of an exemplary connector module **100**A including multiple body members **110**, **140**, springs **130**A, **130**B, and alignment pins **160**A, **160**B. The connector module **100**A may include two structures that couple together to form the base of the connector module **100**A. One of the structures may include a pin keeper **140**, which as the name may imply holds alignment pins **160**A, **160**B captured at points **146**A, **146**B. When the module **100**A is inserted into a housing, it is desirable for the fiber cores to be aligned without being skewed in the housing for good optical signal transmission. To minimize play, the holes **146**A, **146**B for coupling with the alignment pins **160**A, **160**B may have tight tolerances for holding the alignment pins **160**A, **160**B. In some embodiments, the pins **160**A, **160**B may have grooves that fit into corresponding chamfered rings or blocks (not shown) within the holes **146**A, **146**B

The connector module **100**A may include a plug assembly or body component **110** with a latching mechanism **112**. To couple to the pin keeper **140**, body component **110** includes coupling means such as the latch blocks **116**A (upper latch block obscured) that secure the corresponding latch hook **117** from the pin keeper **140**. Latch guides may also be included to help the pin keeper **140** slide into the latch block. The body component **110** may include holes or recesses **114**A, **114**B for capturing the springs **130**A, **130**B. On the corresponding areas of the pin keeper **140**, there may be extension rods **142**A, **142**B to securely couple with the springs **130**A, **130**B. Springs **130**A, **130**B are used to provide a forward bias or force to push the front components against a housing. In the example of FIG. **1**A, when the assembled connector module **100**A is inserted into a housing the latch mechanism **112** braces against the latching point. In this manner, the connector module **100**A is able to provide a forward bias by way of the springs **130**A, **130**B so that the optical fiber core is aligned and mated securely with a corresponding optical fiber core or other receiving device.

The connector module **100**A is shown having an open side **111** that spans the entire length of the body component **110**. The corresponding face on the pin keeper **140** may also have an open side **141** spanning the length of the pin keeper **140** such that there's a side opening spanning the length of the connector module **100**A. The open side enables side installation of a terminated ferrule, with the ribbon cable being inserted into the connector module **100**A on the side. One advantage of side installation may include flexibility in the process of assembling the terminated ferrule and connector module **100**A. With side installation, the terminated ferrule may be inserted into an already assembled connector module (that will be more apparent in, e.g., FIGS. **2**A-B). This flexibility enables the process of assembling the connector module to be independent of the process of terminating the ferrule. For example, the assembly of the connector module may be completed prior to, during, or after terminating the ferrule.

Without the side opening feature, a ribbon cable may need to pass through a connector module before being terminated to the ferrule so that it may not be possible to assemble an already terminated ferrule with an assembled connector module.

In the embodiment of FIG. **1**A, the body component **110** is shown with a tab **119** or partial flange that aids in retaining the ribbon cable when the ribbon cable is inserted into connector module **100**A. The tab **119** or partial flange may be designed to allow sufficient space to slip the ribbon cable into the space of the connector module **100**A, e.g., by not spanning most of, or all of, the open gap.

While the embodiment shown in the FIG. **1**A includes a particular configuration, one skilled in the art will recognize that other configurations are possible. For example, while the configuration shows two pins and two springs, other configurations may include one or more pins and one or more springs. As well, the alignment design, biasing element design, and latching means may vary based on system design. In some embodiments where the connector module **100**A is intended for retrofitting into existing designs, the particular configuration (e.g., mating surfaces/pins, latch design, etc.) may be dictated by the existing designs.

FIG. **1**B is a perspective view of a partially assembled exemplary connector module, e.g., using the components of connector module **100**A of FIG. **1**. The view of FIG. **1**B

shows a bottom perspective of the connector module **100**B that illuminates some obscured elements in FIG. **1**A such as the top latch tab **116**B and top latch guide. In the example of FIG. **1**B, the pins **160**A, **160**B have been inserted into the pin keeper **140** and the springs **130**A, **130**B have been fitted over the extension rods **142**A, **142**B (obscured by springs). FIG. **1**B shows the pin keeper **140** and springs **130**A, **130**B in position to slide into the body component **110** to complete assembly of the connector module **100**B. The latch hook **117** slides past the latch guides into the latch blocks **116**A, **116**B; the springs slide into the recesses **114**A, **114**B of the body component **110**.

FIG. **1**C is a perspective view of an assembled exemplary connector module **100**C, e.g., using the components of connector module **100**A of FIG. **1**. In FIG. **1**B, the connector module is shown partially assembled; FIG. **1**C shows the completed assembly with the springs **130**A, **130**B fully inserted into the recesses **114**A, **114**B of body component **110**, and the latch hook **117** secured against the latch block **116**A. As shown, the shells of the pin keeper **140** and the body component **110** do not cover the entire surface area of the connector module **100**C with a substantial gap between the two components so that the springs **130**A, **130**B may be compressed to provide appropriate physical contact force for the ferrule as it mates to another ferrule.

The connector module **100**C is assembled with the open side **141** of the pin keeper **140** and open side **111** of the body component **110** facing the same direction. With this orientation, the opening spans the length of the connector module **100**C so that a terminated ferrule may be mated to the connector module **100**C with the ferrule ribbon cable inserted sideways into the connector module **100**C. While the embodiment shown in FIG. **1**C includes a configuration with the side opening as illustrated, one skilled in the art will appreciate that the opening size, location, etc. may vary based on system design.

FIG. **2**A is a perspective view of the assembled exemplary connector module **100**C next to a terminated ferrule **205**. The terminated ferrule **205** may include the ferrule **210** and an attached ribbon cable **220** containing the optical fibers (not shown). Through-holes **246**A, **246**B on the ferrule are configured to slide through the alignment pins **160**A, **160**B.

An axis diagram with X, Y, Z axes is provided to facilitate discussion regarding mating the connector module **100**C with the terminated ferrule **205**. In the example of FIG. **2**A, the side opening on the connector module **100**C is along the X-axis. The terminated ferrule **205** with the ribbon cable **220** is similarly aligned along the same X-axis. To mate the terminated ferrule **205** with the connector module **100**C the alignments pins **160**A, **160**B may be lined up with the through-holes **246**A, **246**B on the ferrule **210**, and the ribbon cable **220** is deposited into the inside cavity of the connector module **100**C. As illustrated the gap at tab **119** may be smaller than the width of the ribbon cable **220** (width in the Z-axis) so that the ribbon cable **220** may need to be rotated or tilted to be inserted into the connector module. Because the ribbon cable **220** may be semi-rigid it may be preferable to first insert the ribbon cable **220** before sliding the ferrule **210** into the alignment pins **160**A, **160**B.

FIG. **2**B is a perspective view of the assembled exemplary connector module mated to the terminated ferrule. When the entire assembly **200**B is mated, the pins **160**A, **160**B protrude through the ferrule **210** to align with a housing that receives the entire assembly **200**B. As shown, the gap at the opening near tab **119** is smaller than the width of the ribbon cable **220** so that the ribbon cable **220** is retained within the inside space of the connector module and does not accidentally slip outside.

The springs **130**A, **130**B are located on the same plane (z-plane) as the ribbon cable **220** and may occupy space otherwise available for the ribbon cable **220**. In other embodiments, the springs may be re-located (e.g., off-axis) or reduced in size to provide more space for wider ribbon cables. Another embodiment is provided starting in FIG. **3**A that may accommodate a wider ribbon cable.

FIGS. **3**A-B are perspective views of another exemplary connector module **300** including a body member **310** and spring **320**. The pin keeper (not shown) will be described below with reference to FIG. **4**A. FIG. **3**A shows a side perspective view, and FIG. **3**B shows a bottom perspective view illustrating the gap **330** at the bottom for insertion of a ribbon cable. The embodiment of FIG. **3**A may accommodate a wider ribbon cable because the ribbon cable is inserted within the interior of the spring **320** itself so that the size of the spring doesn't occupy the space. FIG. **3**C shows the spring **320** may be designed with a "U" or "C" shape (when viewing the spring from the front in the direction of **390**) including an opening **324** for the ribbon cable to slide into the interior space **326**. The spring may also be referred to as a wire-binding type spring. To provide the opening **324**, the spring is not wound in a spiral like a typical spring, but rather follows an example pattern as illustrated in FIGS. **3**A-B. The spring pattern may include curved lips **322**A, **322**B to help retain the ribbon cable deposited within the space **326** of the spring **320**. The spring **320** may provide a forward bias or force for ensuring a stable connection of the optical fibers.

The body component **310** of the connector module **300** may include an area to secure the spring **320** with a retaining block **314** or chamfered block. There may be one or more retaining blocks **314** of various sizes for the spring **320**. A latching mechanism **312** towards the rear of the connector module **300** secures the connector module **300** when plugged into a housing.

FIG. **4**A is a perspective view of the exemplary connector module, e.g., of FIG. **3**A, next to a terminated ferrule **405**. FIG. **4**A shows the pin keeper **440** of the connector module in position prior to sliding into the through-holes **446**A, **446**B of the ferrule **410**. In the embodiment of FIG. **4**A, the ribbon cable **420** may be wider (e.g., than the ribbon cable **220** shown in FIG. **2**A) holding more optical fiber cores. To accommodate the wider ribbon cable **420**, some of the components may be configured to provide the extra space occupied by the ribbon cable **420**. For example, the inside areas of pin keeper **440** may farther apart, the configuration may use smaller pins **460**A, **460**B, and use smaller through-holes **446**A, **446**B on the ferrule **410**. One skilled in the art will recognize that the configuration may change based on the desired design including the ribbon cable characteristics.

In the example of FIG. **4**A, the terminated ferrule **405** and pin keeper **440** are in position for mating to the rest of the connector module with the spring **320** and body component **310**. The alignment pins **460**A, **460**B of the pin keeper are lined up with the ferrule **410**; the ribbon cable **420** is placed in an orientation for inserting into the connector module body **310** in the direction of **408** through the open gap **330**. When the pin keeper **440** is mated to the body component **310**, the spring **320** may be inserted into retaining blocks or chamfered blocks (now shown) on the pin keeper **440**.

FIG. **4**B is a perspective view of the assembled exemplary connector module **400**B, e.g., corresponding to the partially assembled connector module **400**A of FIG. **4**A. In this view,

all components have been assembled together. The alignment pins **460**A, **460**B are shown protruding from the ferrule **410** after being inserted past the through-holes of the ferrule **410**. The spring **320** is braced between the pin keeper **440** and body component **310**, secured in the retainer blocks on the two components. As shown, the shells of the pin keeper **440** and the body component **310** do not cover the entire surface area of the connector module **400**B with a substantial gap between the two components so that the spring **320** may be compressed to provide appropriate physical contact force for the ferrule as it mates to another ferrule. The ribbon cable **420** is inserted into the space within the spring **320**, as illustrated in FIG. **4**C, showing a front view of the spring **320** along with a cross-section view of the ribbon cable **420'** after it has been deposited within the spring **320**.

FIGS. **5**A-C are perspective views of a configuration **500** with the connector modules latched into a housing **510**, with FIG. **5**A showing a top perspective view, FIG. **5**B showing a bottom perspective view, and FIG. **5**C showing a side perspective view of the configuration **500**. The configuration **500** shows a housing **510** with four ports. The connector modules may be the modules **200**A of FIG. **2**A, **400**B of FIG. **4**B, with modules of other designs **530**, **540** (e.g., pre-existing designs). The front end of each connector module passes through the housing to enable a signal connection to corresponding connector modules (now shown).

FIG. **6** is a flow chart illustrating an exemplary method **600** for assembling a connector module. For example, the method may illustrate the steps for assembling the configuration **100**A of connector module components of FIG. **1**A, with the various stages of the configurations in FIGS. **1**B-C and FIGS. **2**A-B.

At step **610**, the method may include coupling a first connector body member to a second connector body member using at least one biasing component. The at least one biasing component may be springs or other suitable devices.

At step **620**, the method may include latching the first connector body member to the second connector body member. For example, the first connector body member may include latch hooks and the second connector body member may include latch blocks to enable the two parts to latch together. In other embodiments, other suitable latching means may be used, or means other than latches may be used to couple the components. At step **630**, the method may include passing the ribbon cable through an open side of the second connector body member. At step **640**, the method may include coupling the first connector body member to the ferrule, e.g., using an alignment component such as the alignment pins.

The method may include depositing the alignment components in cavities of the first connector body member, where coupling the first connector body member to the ferrule includes inserting the alignment components through holes of the ferrule. The method may include depositing the biasing components in cavities of the second connector body member and mating the biasing components to the first connector body member at extension sections (e.g., extension rods).

FIG. **7** is a flow chart illustrating another exemplary method **700** for assembling a connector module. For example, the method may illustrate the steps for assembling the configuration **400**A of connector module components of FIG. **4**A, with the various stages of the configurations in FIGS. **4**B-C.

At step **710**, the method may include coupling a first connector body member to a second connector body member using a biasing component. The biasing component may be a spring or other suitable device. For example, the spring may be the C or U-shaped spring **320** shown in FIG. **4**A.

At step **720**, the method may include passing the ribbon cable of the ferrule through an open side of the second connector body member into a through-channel of the second connector body member. At step **730**, the method may include passing the ribbon cable of the ferrule through an open side of a biasing component into the interior of the biasing component. At step **740**, the method may include coupling, using at least one alignment component, the first connector body member to the ferrule.

The method may include depositing alignment components in cavities of the first connector body member, where coupling the first connector body member to the ferrule includes inserting the alignment components through holes of the ferrule. The method may include securing the biasing component in a first tab of first connector body member. The method may include securing the biasing component in a second tab of second connector body member.

It is understood that the specific order or hierarchy of steps in the processes disclosed is an illustration of exemplary approaches. Based upon design preferences, it is understood that the specific order or hierarchy of steps in the processes may be rearranged. Further, some steps may be combined or omitted. The accompanying method claims present elements of the various steps in a sample order, and are not meant to be limited to the specific order or hierarchy presented.

The previous description is provided to enable any person skilled in the art to practice the various aspects described herein. Various modifications to these aspects will be readily apparent to those skilled in the art, and the generic principles defined herein may be applied to other aspects. Thus, the claims are not intended to be limited to the aspects shown herein, but is to be accorded the full scope consistent with the language claims, wherein reference to an element in the singular is not intended to mean "one and only one" unless specifically so stated, but rather "one or more." Unless specifically stated otherwise, the term "some" refers to one or more. All structural and functional equivalents to the elements of the various aspects described throughout this disclosure that are known or later come to be known to those of ordinary skill in the art are expressly incorporated herein by reference and are intended to be encompassed by the claims. Moreover, nothing disclosed herein is intended to be dedicated to the public regardless of whether such disclosure is explicitly recited in the claims. No claim element is to be construed as a means plus function unless the element is expressly recited using the phrase "means for."

The invention claimed is:

1. An optical fiber connector module for coupling to a ferrule terminated to at least one fiber in a ribbon cable, the optical fiber connector module comprising:

a first connector body member for coupling to the ferrule, the first connector body member comprising:
at least one alignment component coupling section,
at least one biasing component coupling section, and
a first through-channel for the ribbon cable; and

a second connector body member coupled to the first connector body member, the second connector body member comprising:
at least one biasing component coupling section,
a second through-channel for the ribbon cable, and
an open side spanning the length of the second connector body member providing access to the second through-channel for the ribbon cable;

and wherein the second connector body member is configured for coupling to a connector module housing without enclosing or covering the open side.

2. The optical fiber connector module of claim **1**, wherein the second connector body member further comprises at least one extended tab along a portion of the open side for retaining the ribbon cable.

3. The optical fiber connector module of claim **1**, wherein the first connector body member further comprises an open side on a same lateral surface and along a same axis as the open side of the second connector body member, with the same axis oriented in a same direction as a length of the at least one fiber.

4. The optical fiber connector module of claim **1**, wherein the second connector body member further comprises a graspable latching mechanism for securing the optical fiber connector module within a connector module housing.

5. The optical fiber connector module of claim **1**, wherein the first connector body member further comprises a latching mechanism and the second connector body member further comprises a retainer block, and wherein the second connector body member is coupled to the first connector body member via the latching mechanism and the retainer block.

6. The optical fiber connector module of claim **1**, further comprising at least two alignment components, wherein the first connector body member comprises at least two alignment component coupling sections consisting of cavities for insertion of the least two alignment components.

7. The optical fiber connector module of claim **6**, wherein the at least two alignment components pass through channels in the ferrule when the first connector body member is coupled to the ferrule.

8. The optical fiber connector module of claim **1**, further comprising at least two biasing components, wherein the first connector body member comprises at least two biasing component coupling sections consisting of extensions on a side of the first connector body member, with the extensions securing the at least two biasing components relative to the first connector body member.

9. The optical fiber connector module of claim **8**, wherein the second connector body member comprises at least two biasing component coupling sections consisting of cavities within the second connector body member, wherein first ends of the least two biasing components are coupled to the first connector body member and other ends of the least two biasing components are coupled to the second connector body member.

10. The optical fiber connector module of claim **8**, wherein the at least two biasing components provide forward bias based in part on the graspable latching mechanism bracing against the connector module housing, the forward bias provided in the direction from the ferrule to a corresponding ferrule within the connector module housing ensuring a firm coupling pressure for the least one fiber in the ribbon cable.

11. The optical fiber connector module of claim **1**, further comprising a biasing component with a U shape.

12. A method for assembling an optical fiber connector module that couples to a ferrule terminated to at least one fiber in a ribbon cable, the method comprising, in any operative order:

coupling, using at least one biasing component, a first connector body member to a second connector body member;

latching the first connector body member to the second connector body member;

passing the ribbon cable of the ferrule through an open side of the second connector body member; and

coupling, using at least one alignment component, the first connector body member to the ferrule; and

coupling the second connector body member to a connector module housing without enclosing or covering the open side.

13. The method of claim **12**, further comprising depositing the at least one alignment component in at least one cavity of the first connector body member, wherein coupling the first connector body member to the ferrule comprises inserting the at least one alignment component through holes of the ferrule.

14. The method of claim **12**, further comprising depositing the at least one biasing component in at least one cavity of the second connector body member and mating the at least one biasing component to the first connector body member at extension sections.

15. The method of claim **12**, wherein latching comprises securing a latch of the first connector body member to a latch block on the second connector body member.

16. A method for assembling an optical fiber connector module that couples to a ferrule terminated to at least one fiber in a ribbon cable, the method comprising, in any operative order:

coupling, using a biasing component, a first connector body member to a second connector body member;

passing the ribbon cable of the ferrule through an open side of the second connector body member into a through-channel of the second connector body member;

passing the ribbon cable of the ferrule through an open side of the biasing component into the interior of the biasing component; and

coupling, using at least one alignment component, the first connector body member to the ferrule.

17. The method of claim **16**, further comprising depositing the at least one alignment component in at least one cavity of the first connector body member, wherein coupling the first connector body member to the ferrule comprises inserting the at least one alignment component through holes of the ferrule.

18. The method of claim **16**, further comprising:

securing the biasing component in a first tab of first connector body member; and

securing the biasing component in a second tab of second connector body member.

19. The method of claim **16**, wherein the open side of the biasing component and open side of the second connector body member are aligned such that the ribbon cable can pass through from the open side of the second connector body member to the interior space of the biasing component.

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